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**APPLICATION FOR LETTERS PATENT**

for

**FLEXIBLE CABLE CONTAINER PAYOUT TUBE**

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&

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## **FLEXIBLE CABLE CONTAINER PAYOUT TUBE**

### **FIELD OF THE INVENTION**

[001] This invention generally relates to voice, video and data communication cables. More particularly, the invention relates to storage containers for communication cables and methods for removing the cables from these storage containers. Even more particularly, this invention relates to flexible payout tubes for storage containers and methods for using the flexible tubes when removing the cable from the storage containers.

### **BACKGROUND OF THE INVENTION**

[002] Communication cables are generally used to transmit a variety of signals, including voice, video, and data signals. Each cable typically contains a single or multiple strands of a transmission media (e.g., conductor often made of copper) coated with an insulating material. The communication cables are generally packaged, stored, and shipped in storage containers, such as cable boxes or cartons.

[003] The current practice in packaging cables is to coil the cables in a "figure eight" configuration in the storage container to reduce twisting of the wire as it is coiled. This configuration has the added benefit of reducing the tendency of the cable to kink as it is pulled from the container (typically through an opening in one of the walls of the container). The process of pulling the cable from the container can be facilitated by using a payout tube that extends into the container. The payout tube can be affixed or attached to a wall of the container so a portion also extends outside of the carton.

[004] There are numerous types and configurations of payout tubes. As well, there are numerous types and configurations of mechanisms used to attach the payout tubes to the wall of the container. See, for example, U.S. Patent Nos.

4009845, 4022399, 4057204, 4274607, 4373687, 5042739, 5150852, 5152476, 5368245, 5520347, 5810272, and 6328238, the disclosures of which are hereby incorporated by reference. Most payout tubes currently used are hollow elongated cylinders that are fairly rigid. As illustrated in Figure 1, these rigid tubes 1 often cause the cable 2 to hang up or tangle, making it difficult to pull the cable 2 from the container. In some cases, the cable 2 kinks 3 so severely that the container has to be opened to free the cable.

[005] There have been many attempts to configure the payout tubes to eliminate such kinking and tangling. Some of these attempts have caused the design of the tubes to be enlarged, increasing the size of the storage container and the payout tube. The added size also increases the cost, decreases the number of containers that can be shipped on a given pallet, and yet does not completely eliminate the kinking and tangling. Other problems have also existed with these attempts, such as degradation of electrical results.

## SUMMARY OF THE INVENTION

[006] The invention provides a payout tube for containers that are used to package and store communication cables. The payout tube is configured with a high degree of flexibility. With this flexibility, the communication cable does not kink or tangle when being removed from the storage container through the payout tube. The payout tube can be provided with this flexibility by eliminating the rigidity of the payout tube without destroying the structure of the tube, such as by forming slots in the portion of the payout tube that needs to be flexible.

## BRIEF DESCRIPTION OF THE DRAWINGS

[007] Figures 1-4 are views of several aspects of the payout tubes and methods for making and using the same according to the invention, in which:

[008] Figure 1 shows a prior art device and the accompanying problems with its use;

[009] Figure 2 shows the use of a payout tube in one aspect of the invention;

[0010] Figure 3 depicts a close-up view of a payout tube in one aspect of the invention; and

[0011] Figure 4 shows a close-up view of the use of a payout tube in another aspect of the invention.

[0012] Figures 1-4 illustrate specific aspects of the invention and are a part of the specification. Together with the following description, the Figures demonstrate and explain the principles of the invention and are views of only particular—rather than complete—portions of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

[0013] The following description provides specific details in order to provide a thorough understanding of the invention. The skilled artisan, however, would understand that the invention can be practiced without employing these specific details. Indeed, the present invention can be practiced by modifying the illustrated cables and methods and can be used in conjunction with apparatus and techniques conventionally used in the industry. For example, the invention is described below for communication cables, but could be used with any type of cable or wire that is extracted from a storage container using a payout tube.

[0014] As noted above, the invention contains a flexible payout tube that is used when extracting cable from a storage container. In one aspect, the invention is used with the payout tubes and storage containers cable illustrated in the Figures. Of course, the invention could be used with other payout tubes and storage containers, so long as the desired degree of flexibility can be provided.

[0015] Figure 2 shows a payout tube 5 that has been placed in a wall 10 of a storage container 50. The payout tube 5 of the invention can be used with any known storage container in the art. Examples of such storage containers include cartons, cardboard boxes, boxes, buckets, bags, and the like. In one aspect of the invention, the payout tube is used in combination with a cardboard box as the storage container.

As well, although illustrated as a cylinder with a substantially circular cross-section, other cross-sections and shapes can be used for the payout tube.

[0016] The communication cable 55 is stored in the storage container for packaging and shipping of the cable. Generally, the cable 55 is wound in any configuration that maintains the integrity of the cable while maximizing the amount of cable within the storage container. Typically, the cable is wound in a "figure eight" configuration in the storage container.

[0017] As shown in Figure 2, the payout tube 5 is mounted to the wall of the storage container by any suitable means known in the art. Examples of such means include a locking snap ring, cardboard inserts, tabs, as well as the means described in the patents referenced above.

[0018] In one aspect of the invention, and as shown in Figure 2, the mounting means is a flange 20 and opposed tabs 25. The flange 20 is located on the inner side of the wall 10 of the storage container while the tabs 25 are located on the exterior of the wall 10. The purpose of the flange 20 and the tabs 25 is to mount the payout tube 5 on the wall 10 of the storage container 50, as well as to lock the payout tube 5 in place. Any configuration for the flange 20 and tabs 25 that accomplishes that function can be used in the invention. In one aspect of the invention, the tabs and flange are configured as illustrated in Figure 3.

[0019] The payout tube 5 is mounted into the storage container by sliding the front end 30 of the payout tube through a pre-existing hole in the wall 10. The payout tube slides through the hole until flange 20 substantially abuts the inner side of the wall. The tabs are configured so that they slide through the hole when the payout tube is inserted into the wall and then extend and abut the exterior of the wall. With the flange 20 and tabs 25 abutting the interior and exterior of the wall 10, their combination serves to substantially lock the payout tube in place in the wall. In one aspect of the invention, a snap ring (not shown) can be placed between the tabs 25 and the wall 10 of the storage container to aid in locking the payout tube in place relative to the wall 10.

[0020] The back end 35 of the payout tube 5 remains in the interior of the storage container 50. In such a position, the cable is extracted from the storage

container through the back end 35 of the payout tube 5, through the wall 10, and then through the front end 30 of the payout tube. Provided the payout tube 5 operates as described herein, the front end 30 and the back end 35 can be made either longer or shorter than as described and illustrated (typically about 2 and about 8 inches, respectively). In one aspect of the invention, this distance can range from about 1 to about 20 inches. As well, the diameter of the payout tube can be either wider or narrower than as described (typically from about 1 ½ times the material outer diameter (O.D.) to about 20 times the material O.D.) and illustrated (about ¾ inch inner diameter). In one aspect of the invention, this diameter can range from about 3 to about 5 times the material O.D.

[0021] The back end 35 of the payout tube 5 is configured to increase the flexibility of the payout tube 5 when compared to known payout tubes. As described above, conventional payout tubes are rigid and are not very flexible. When the cable is pulled from the storage container, the cable enters the payout tube from many angles (i.e., because of the "Figure 8" configuration in which the cable is stored in the container). Since the payout tube does not bend or flex, the cable becomes tangled or kinked on the end of the payout tube as shown in Figure 1.

[0022] Using the invention, the flexibility of the back end of the payout tube is increased. Thus, when the cable enters the payout tube, the tube bends and flexes towards the direction at which the cable enters the payout tube. The net result is that kinking and tangling of the cable is reduced or eliminated in most instances since the angle at which the cable enters the payout tube is fairly small.

[0023] The amount of increased flexibility that can—or needs to—be provided depends on the configuration of the cable within the storage container, and the material used to make the payout tube (e.g., polyethylene, polypropylene, ABS, cardboard, steel, wood, and any other material conventionally used in the art of reel & spool making). In one aspect of the invention, the payout tube of the invention can bend or flex in a radius ranging from 1 to about 120 degrees. In another aspect of the invention, the payout tube of the invention can bend or flex in a radius from about 5 degrees to about 90 degrees.

[0024] The increased flexibility for the back end of the payout tube can be provided using any known mechanism. Examples of such mechanisms include using more flexible materials in constructing the payout tube, increasing the flexibility in the wall of the storage container or mounting fixture (i.e. ball and socket), as well as the mechanism described below. In one aspect of the invention, and as illustrated in Figure 4, the flexibility can be provided using corrugations 45 in the payout tube 5. The width, length, number, and placement of the corrugations 45 depend on the material used, the process of making the corrugations, (interlocking or ribbed), the desired flexibility, the length of the back end 35, the type of corrugations (ribbed, wavy, uneven, or flexible joints), and the type of locking mechanism. In one aspect of the invention, the corrugations 45 can be placed along the entire length (or only a portion) of the back end 35 in any desired density.

[0025] In another aspect of the invention and as illustrated in Figure 3, the flexibility can be provided using a plurality of slots, holes, grooves, discontinuities, or a combination thereof (hereinafter "slots" 40) in the payout tube 5. The size, shape, number, configuration, pattern, and placement of the slots 40 depend on the material used, the process of making the slots, the desired flexibility, the length of the back end 35, length of tube 5 and the strength needed for the package material. For example, the number of slots 40 should be relative to the desired flexibility and required strength of the payout tube 5. The shape of the slots 40 can be substantially rectangular, circular, square, polygonal, triangular, or a combination thereof. The slots 40 can be placed along the entire length (or only a portion) of the back end 35 of the payout tube 5 in any desired density.

[0026] In the aspect of the invention illustrated in Figure 3, the back end 35 of the payout tube 5 is made flexible. In another aspect of the invention, the front end 30 can also—or instead of—be made flexible in a similar manner. Making the front end 30 also flexible is usually desired where the front end 30 of the payout tube 5 extends a distance from the wall that would cause the cable to kink or tangle, i.e., greater than about 1.5 times the cross sectional distance of the continuous length material.

[0027] The payout tubes of the invention can be made in any process that results in the structure described and illustrated herein. In one aspect of the invention, the payout tube is purchased "off the shelf" (i.e., EZ Tubes from Windings, Inc.) and the slots are then formed by any suitable method. Examples of methods for forming the slots include mill cutting processes, punch-out processes, torch, drill, graft, or flexible tube abrasive cutting.

[0028] In another aspect of the invention, the flexible payout tubes of the invention are made using an extrusion or molding process as known in the art. In the invention, however, the mold for the extrusion or other molding contains corresponding components for forming the slots rather than a smooth surface. Thus, when the molding process is completed, the payout tube will contain the slots.

[0029] Using the flexible payout tube of the invention provides several advantages. First, by making the tube flexible, the storage container size and the packaging costs can be reduced. This reduction can also lead to an increased pallet quantity, i.e., more storage containers can be fit on a pallet that is used in shipping. Another advantage is that the flexible payout tube also does not degrade performance (i.e., electrical or physical) of the cables by reducing or eliminating damage of the cable as it is pulled from the storage container. Finally, less force is required to pull the continuous length of material from the storage retainer, thereby maintaining the physical properties of the cable at a maximum.

[0030] The invention could be also be used for any continuous length of material that is packaged in a storage container and then removed through a hole in the wall. Example of such materials include communication wires and cables, building wires and cables, electrical wires, steel strands, tire cords and cables, ropes, and tubing.

[0031] Having described these aspects of the invention, it is understood that the invention defined by the appended claims is not to be limited by particular details set forth in the above description, as many apparent variations thereof are possible without departing from the spirit or scope thereof.